GENERAL NOTES

1. THERE SHALL BE A MINIMUM 1 INCH GAP FROM THE ENDS OF THE DEFORMED REBARS TO THE TOP OR BOTTOM OF THE CONCRETE SLAB.

2. DO NOT DRILL HOLE COMPLETELY THROUGH THE SLAB, SO THAT THE EPOXY/GROUT WILL BE CONTAINED IN THE HOLE WHILE BACK FILLING.

CROSS STITCHING BAR DIMENSIONS AND LOCATION OF DRILL HOLES

<table>
<thead>
<tr>
<th>ANGLE</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>5.75</td>
<td>6.50</td>
<td>7.25</td>
<td>7.75</td>
<td>8.50</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.50</td>
<td>7.25</td>
<td>7.75</td>
<td>8.25</td>
<td>-</td>
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<tr>
<td>45</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8.00</td>
<td>8.50</td>
<td>7.00</td>
<td>7.50</td>
</tr>
</tbody>
</table>

DISTANCE TO HOLE (IN.)

<table>
<thead>
<tr>
<th>LENGTH OF BAR (L) (IN.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
</tr>
<tr>
<td>9.50 11.00 12.50 14.50 16.00</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>- 11.00 12.50 14.00 16.00 18.00</td>
</tr>
<tr>
<td>45</td>
</tr>
<tr>
<td>-  - 12.00 14.00 16.00 18.00</td>
</tr>
</tbody>
</table>

EPOXY COATED BAR NUMBER (#)

6 6 6 6 6 6 6 6

CROSS STITCHING DETAILS FOR POOR BY OR MORE IN THICKNESS

SECTION A-A

DEFORMED STEEL REINFORCING BAR, GRADE 60, EPOXY COATED (TYP.) FOR BAR DIAMETER AND LENGTH, SEE ABOVE TABLE.

DRILLED HOLE SHALL BE INJECTED WITH EPOXY/GROUT OR CEMENTITIOUS GROUT BEFORE INSERTION OF DEFORMED, EPOXY COATED STEEL REINFORCING BAR

CONCRETE PAVEMENT CRACK REPAIR


STANDARD PLAN NO. M-412-2

Last modification Date: 10/07/19

Issued by the Project Development Branch: July 31, 2019

Project Sheet Number:

Project Development Branch: JBK
LONGITUDINAL JOINT
TRANSVERSE OR
LONGITUDINAL JOINT

PLAN VIEW

EXISTING CONCRETE PAVEMENT

SECTION B-B

SLOT STITCHING DETAILS
FOR PCCP OR MORE IN THICKNESS

SECTION C-C

CONCRETE PAVEMENT
CRACK REPAIR

<table>
<thead>
<tr>
<th>PAVEMENT THICKNESS (T)</th>
<th>TIE BAR SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>T &lt; 5 INCHES ON UNBOUND BASE</td>
<td>#4</td>
</tr>
<tr>
<td>5 INCHES &lt; T &lt; 8 INCHES</td>
<td>#5</td>
</tr>
<tr>
<td>8 INCHES &lt; T</td>
<td>#6</td>
</tr>
</tbody>
</table>

TIE BARS SHOULD BE PLACED APPROXIMATELY PERPENDICULAR TO THE GENERAL TREND OF THE CRACK.

TYPICAL CHAIR DETAIL
ONE REQUIRED UNDER EACH END OF THE BAR

PAVEMENT THICKNESS (T) TIE BAR SIZE

1.75" TO 2.25"

SECTION 8-8
SLOT STITCHING DETAILS
FOR PCCP 8

CRACK REPAIR Standard Sheet No. 2 of 4
Issued by the Project Development Branch: July 31, 2019

Computer File Information
Sheet Revisions
Colorado Department of Transportation
2029 West Howard Place
DENVER, CO 80224
Phone: 303-757-9021 FAX: 303-757-0858
Project Development Branch: JBK

STANDARD PLAN NO.
M-412-2

GEO) Sheet 2 of 4
Project Sheet Number:

10/07/19
10/07/19
10/07/19
10/07/19
10/07/19
10/07/19
10/07/19
10/07/19
10/07/19
10/07/19
10/07/19
NOTES

1. IF A LONGITUDINAL JOINT IS PRESENT IN THE WHEEL PATH OR AT THE MIDDLE OF THE SLAB, CONTACT THE ENGINEER.

2. DOWELS SHALL BE A MINIMUM OF 1 FT. - 6 INCHES AWAY FROM ANY LONGITUDINAL JOINT.
SECTION G-G

Dowel Bar Retrofit Details

Plan View

- Depth of concrete patch material
- Adds existing concrete surface for projects that will be diamond grinding
- Make flush with existing pavement surface if diamond grinding will not be required

Section H-H

Typical Chair Detail

One required under each end of dowel bar

Concrete Pavement

CRACK REPAIR


Issued by the Project Development Branch: July 31, 2019

Project Sheet Number:
IN ACCORDANCE WITH
EXCAVATION & BACKFILL
PAID FOR TO THIS LINE
SECTION 206.

WILL BE MEASURED AND
THICKNESS PLACE AN APPROVED JOINT.

FILLED WITH DRY, FINE SAND
APPROXIMATE 1" SPACE BETWEEN

MINIMUM JOINT DEPTH IS 4" BUT 75% IS
RECOMMENDED.

JOINT EXCAVATION & BACKFILL

Grout or foam sealant shall be used when specified on the plans.

Grout or foam sealant shall be used when specified on the plans.

MINIMUM JOINT DEPTH IS 4" BUT 75% IS
RECOMMENDED.

JOINT EXCAVATION & BACKFILL

Bedding Alternative 1 consists of 6 in. of aggregate base course (Class 6) compacted to not less than 95% maximum density determined in conformance with AASHTO T 16.

Bedding Alternative 2 consists of an 1 in. thick, minimal lean concrete base. Cement content = 250 lbs/cu. yd.

ACCRETION DESIGNATION FOR ALTERNATIVE 2 BEDDING:

PASSING 2 IN. SEIVE ---- 100x
PASSING NO. 4 SEIVE ---- 20x TO 70x
PASSING NO. 200 SEIVE ---- 5x TO 10x

CIRC JOINTS USING RUBBER GASKETS SHALL MEET ASTM C677.

CLASS C DAMAGE GEOTEXTILE SHALL BE COMPLETELY WRAPPED AROUND ALL CIRC JOINTS WHICH DO NOT HAVE RUBBER GASKETS. THE GEOTEXTILE SHALL EXTEND A MINIMUM OF 1 FT. ON EACH SIDE OF JOINTS AND SHALL OVERLAP AND BE SECURELY ATTACHED FOR AT LEAST 1 FT. AT ITS ENDS. THE WRAP SHALL BE A SMOOTH FIT (NOT LOOSE OR STRETCHED) JUST PRIOR TO BACKFILL. THE GEOTEXTILE MATERIAL SHALL MEET THE APPLICABLE REQUIREMENTS OF SECTION 433. COST FOR GEOTEXTILE WILL NOT BE MEASURED AND PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE WORK.

GENERAL NOTES
1. ALL PRECAST CONCRETE BOX CULVERTS SHALL CONFORM TO THE LRFD DESIGN REQUIREMENTS OF ASTM C 1577, AND THE FOLLOWING SPECIFICATIONS:

ITEM OR CONDITION
AASHTO
EQUIV. ASTM
COST SPECIFICATION
PREFORMED JOINT MATERIAL
W 188, 61 OR 6.2
C 990, 61 OR 6.2
705.00

ELECTRONICALLY SEALED DESIGN CALCULATIONS, INDEPENDENT CHECK, AND RATING FOR A PRECAST BOX CULVERT WITH SPANS NOT INCLUDED IN C 1577 SHALL BE PROVIDED BY THE MANUFACTURER IN ACCORDANCE WITH THE CURRENT CDOT BRIDGE DESIGN AND RATING MANUALS.

2. THE CONTRACTOR SHALL SUBMIT ELECTRONICALLY SEALED SHOP DRAWINGS TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION.

3. BEDDING ALTERNATIVE 1 OR 2 IS REQUIRED.

BEDDING ALTERNATIVE IS AT THE CONTRACTORS OPTION. BEDDING AND EXCAVATION FOR BEDDING WILL NOT BE MEASURED AND PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE WORK.

4. FOR ANY CULVERT SPAN OR COMBINATION OF SPANS FOR MULTIPLE BOXES 20 FEET OR SMALLER, A FOUNDATION INVESTIGATION AND REPORT ARE REQUIRED.

5. FOR ALL HEADWALLS EXCEPT A TOTAL OF 2 FEET, A WATERPROOFING MEMBRANE OR 30 MIL THICK GEOMEMBRANE SHALL BE PROVIDED FOR THE TOP OF THE STRUCTURE.

6. SEE W-601-1, 2, AND 3 FOR CAST-IN-PLACE CONCRETE CULVERT INSTALLATION DETAILS.

COMMENTS

Project Development Branch: July 31, 2019

Computer File Information

Creation Date: 07/31/19

Date: 09/10/20

COMMENTS

Added the Waterproofing membrane in the Construction Notes. Added drawings and revised notes, Added打工 Callouts. Added Revised Notes. Revised notes 1 and 2.

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Project Development Branch J BK

M-603-3

STANDARD SHEET NO. 1 OF 1

STANDARD PLATE NO.

Issued by the Project Development Branch: July 31, 2019

Project Sheet Number:
GENERAL NOTES

1. ALL GUARDRAILS SHOWN ARE MASH 2016 FL-3 COMPLIANT.

2. RATE OF SLOPE DEPENDS ON GUARDRAIL LOCATION:
   A. FOR GUARDRAIL FACE 2 FT. OR LESS FROM THE NORMAL EDGE OF PAVED SHOULDER,
      THE SLOPE SHALL BE 30% OR FLATTER.
   B. FOR GUARDRAIL FACE MORE THAN 2 FT. FROM THE NORMAL EDGE OF THE PAVED SHOULDER,
      THE SLOPE SHALL BE 20% OR FLATTER.

3. WHEN SPECIFIED ON THE PLANS, INSTALL A 2 IN MINIMUM THICKNESS PAVERED SURFACE TO
   1 FT. BEHIND THE GUARDRAIL POSTS OR TO THE EROSION CONTROL CURB AS SHOWN ON PLANS.
   ASPHALT CUTTING & PATCHING OR OTHER APPROVED METHOD SHALL BE USED TO MINIMIZE DAMAGE
   TO ALL PAVERED SURFACES UNDER GUARDRAIL INSTALLATION. ALL REPAIRS TO THE PAVED AREA
   WILL NOT BE MEASURED AND PAID FOR IN SOLELY BUT SHALL BE INCLUDED IN THE COST OF THE
   WORK. A MINIMUM 3 IN THICK FIBER REMEMBERED CONCRETE PAVEMENT MAY ALSO BE USED.
   FOR PAVING BENEATH THE GUARDRAIL, INSTALL THE POST IN A 1/8 IN. OVERSIZED FOMB
   FOR GUARDRAIL RINGS AND TERMINALS AS DIRECTED. PAYMENT FOR THIS PAVED SURFACE
   WILL BE MADE UNDER A PAYMENT OR CONCRETE PAY ITEM WITH QUOTATIONS SHOWN ON THE PLANS.

4. THE GUARDRAIL GUARDRAIL OFFSET FROM PAVED SHOULDER EDGE SHALL BE:
   5 FT. FOR SHOULDER& 6 FT. OR WIDER
   2 FT. FOR SHOULDERS 6 FT. OR LESS
   THE GUARDRAIL OFFSET FROM PAVED INSIDE SHOULDER EDGE OF A DIVIDED HIGHWAY SHALL BE:
   5 FT. MINIMUM FOR SHOULDERS 6 FT. OR WIDER
   2 FT. DESIRED FOR 4 FT. SHOULDER
   THE ABOVE 2 FT. GUARDRAIL TO SHOULDER OFFSET IS DESIRABLE BUT NOT REQUIRED FOR:
   A. FOR AN EXISTING HIGHWAY WITH A DESIGN SPEED LESS THAN 10 MPH, THE MINIMUM OFFSET
      IS 4 FT. FROM THE TRAVELLED WAY.
   B. FOR A ONE WAY ONE-LANE RAMP, AND WHERE ONE DR MORE OF THE FOLLOWING ARE TRUE:
      (1) THE NON-OFFSET GUARDRAIL BEGINS AT LEAST 100 FT. BEYOND RAMP NOSE.
      (2) THE NON-OFFSET GUARDRAIL IS NOT LOCATED ON THE RAMP EXIT DR ENTRANCE
      CURVE CONNECTION TO THE MAJOR HIGHWAY.
      (3) THE RAMP SHOULDERS ARE 4 FT. OR WIDER.
   USE OF GREATER THAN MINIMUM OFFSET DIMENSIONS IS ENCOURAGED TO MEET THE DESIRABLE
   GOAL OF PLACING THE GUARDRAIL AS FAR AS POSSIBLE FROM THE TRAVELLED WAY, EVEN FOR
   SHORT DISTANCES, WHILE PROVIDING A SMOOTH CHANGE IN GUARDRAIL ALIGNMENT.

5. IF 2 FT. CAN NOT BE PROVIDED BETWEEN THE BACK OF THE GUARDRAIL POST AND THE BREAKPOINT,
   USE 7 FT. GUARDRAIL POSTS REFER TO THE "RESTRICTIVE ROADSIDE INSTALLATION" DETAIL.

6. WHEN SPECIFIED ON THE PLANS, INSTALL A 3 IN HIGH TYPE 6 CURB WITH ITS FACE AT OR BEHIND
   THE GUARDRAIL AS AN ALTERNATIVE WHEN SPECIFIED ON THE PLANS, INSTALL A 2 IN x 6 IN.
   TREATED (100 LBS) MIST CURB FASTER WITH A 4 IN. LAG BOLT AND WASHER AT
   EACH GUARDRAIL POST, OR WITH A 4 IN. SEA BOLT WITH WASHER AND NUT AT EACH STEEL POST.
   IF THE 2 IN x 6 IN CURB IS SPECIFIED, IT WILL BE INCLUDED IN THE COST OF THE GUARDRAIL.
   IF APPROVED BY THE ENGINEER, A 2 IN x 6 IN TREATED WOOD CURB MAY BE SUBSTITUTED
   FOR THE 2 IN x 6 IN CURB AND SET ON TOP OF PAVEMENT SURFACE AND ATTACHED AS DESCRIBED ABOVE.
   ALL SPACING SHALL BE ALLOWED IN WOOD CURBS ADJACENT ROWS SHALL BE BOLTED TOGETHER
   AND BOLTED AT A POST LOCATION ADJACENTS SHALL BE LOCATED AT THE POSTS.

7. IF GUARDRAIL FACE IS AT OR IN FRONT OF CURB FACE
   POINT OF SLOPE
   LEAVE OUT EMBANKMENT AREA (SQUARE OR ROUND)
   LEAVE OUT EMBANKMENT AREA (SQUARE OR ROUND)

8. EMBANKMENT ON GUARDRAIL
   LEAVE OUT AREA FOR GUARDRAIL POSTS LOCATED IN PAVEMENT
   LEAVE OUT AREA FOR GUARDRAIL POSTS LOCATED IN PAVEMENT

NOTE: LEAVE-OUT AREA SHALL BE PROVIDED FOR ALL GUARDRAIL POSTS LOCATED IN PAVEMENT TO ALLOW
THE POSTS TO INSTALL THEIR EMBANKMENT SUCH THAT VEHICLE IMPACT LOADS ARE DISTRIBUTED
THROUGH THE POST INTO THE EMBANKMENT MATERIAL PRIOR TO THE POSTS BREAKING PREMATURELY.
7. SEE SHEETS 7 AND 9 FOR CURB TREATMENTS AT GUARDRAIL TERMINALS.

8. IF THIS DIMENSION WILL BE LESS THAN 28 INCHES, RESIZE GUARDRAIL, HEIGHT TO 28 INCHES OR ABOVE.

9. ALL W-BEAM SPLICES, AND SPLICES OF TERMINAL CONNECTORS TO W-BEAM SHALL BE LAPPED IN THE DIRECTION OF TRAFFIC UNLESS OTHERWISE NOTED IN THE PLANS OR BY THE MANUFACTURER.

10. MATERIAL TYPE AND SHAPE OF POSTS AND BLOCKS SHALL BE THE SAME THROUGHOUT THE PROJECT EXCEPT WHEN SPECIFIC POSTS AND BLOCKS ARE SPECIFIED, i.e. AT ENTRANCE AND EXIT CURVES.


12. THE STANDARD 3 IN X 3/4 IN. RECTANGULAR WASHED UNDER POST BOLTS HEADS IN THE POST MAY REMAIN IN EXISTING INSTALLATIONS BUT SHALL NOT BE USED IN NEW CONSTRUCTION, REPAIR OR RESETTING OF THE PIECE.

13. STANDARD GALVANIZED ROUND STEEL WASHERS SHALL BE USED UNDER ALL NUTS IN CONTACT WITH WOOD POSTS.

14. AN ADDITIONAL HOLE SHALL BE PROVIDED IN THE POSTS TO FACILITATE FASTENING IN THE BOLTS AND BLOCKS FOR OVERLAP INSTALLATIONS BUT MAY ALSO HAVE ADDITIONAL HOLES UP TO A PER FLANGE FOR MEDIAN GUARDRAIL APPLICATION.


16. AT THE TIME OF INSTALLATION, WOOD POSTS OR BLOCKS WITH SEASONING CHECKS GREATER THAN 1/4 IN. SHALL NOT BE USED WHEN THE CHECK EXCEEDS THE FULL LENGTH OF THE PIECE.

17. WOOD BLOCKS SHALL BE CUT FROM THE SAME CROSS-SECTION, SPECIES, AND GRADE, AND SHALL RECEIVE THE SAME PRESERVATIVE TREATMENT AS THE POSTS WHEN WOOD POSTS ARE USED.

18. REFERENCES SUCH AS STANDARD PLAN SPECIFY HARDWARE DETAILS FROM RHIA GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE PREPARED BY THE AASHTO-NCHRP-JOINT COMMITTEE.

19. GUARDRAIL SYSTEM MANUFACTURED FROM SYNTHETIC MATERIAL WILL BE ACCEPTED AS ALTERNATIVES TO WOOD BLOCKS FOR USE WITH STEEL POSTS PROVIDED THAT THE BLOCKS HAVE RECEIVED FHWA APPROVAL.

20. WOOD POSTS SHALL BE MADE OF TIMBER WITH AN EXTREME FIBER STRESS IN BENDING OF 1200 PSI STRESS GRADE AND POST DIMENSIONS SHALL CONFORM WITH THE RULES OF THE WEST COAST INSPECTION BUREAU, OR THE SOUTHERN PINE BUREAU, OR THE WESTERN WOOD PRODUCTS ASSOCIATION. TIMBER FOR POSTS SHALL BE EITHER ROUGH SAWN (UNPLANED) OR SURFACED FOUR SIDES WITH MINIMAL DIMENSIONS DIAMETER. ONLY ONE TYPE OF SURFACE FINISH SHALL BE USED FOR POSTS AND BLOCKS IN ANY ONE CONTINUOUS LENGTH OF GUARDRAIL.

21. GLULAM POSTS AND BLOCKS WILL BE ACCEPTED AS ALTERNATIVES PROVIDED THAT THE SUPPLIED MATERIALS HAVE RECEIVED FHWA APPROVAL AND THAT THE SUPPLIED MATERIALS HAVE RECEIVED FHWA APPROVAL AND ARE CERTIFIED AS IDENTICAL TO THE SPECIMENS USED FOR TESTING AND APPROVAL. AASHTO M 133 EXCEPT THAT BLOCKS NEED NOT BE INCISED. PRESERVATION PERMITS AND GRADE MEET THE REQUIREMENTS OF THE CONTRACT.

22. PRESSURE TREATMENT OF POSTS AND BLOCKS SHALL CONFORM TO ASHME M 133 EXCEPT THAT BLOCKS MAY BE INCISED.

23. W-BEAM AND THREE-BEAM GUARDRAIL POSTS SHALL BE MANUFACTURED USING ASHME M 270 ASTM A 709 GRADE 36 STEEL UNLESS CORROSION RESISTANT STEEL IS REQUIRED, IN WHICH CASE, THE POST SHALL BE MANUFACTURED FROM ASHME M 270 ASTM A 709 GRADE 50 STEEL.


25. FIELD MODIFICATION TO RAIL ELEMENTS IS ALLOWED PER MANUFACTURER’S RECOMMENDATIONS, OR WITH THE APPROVAL OF THE STANDARDS AND SPECIFICATIONS UNIT. POSTS SHALL NOT BE MODIFIED ON COMPONENTS ON WHICH THE SPECIES COATING HAS BEEN CHANGED, SHALL BE EITHER REZINIZED OR RECOATED IN CONFORMANCE WITH ASHME M 56, OR PAINTED WITH ONE FULL BRUSH COAT OF ZINC RICH PAINT CONFORMING TO MILITARY SPECIFICATION QQ-P-2305A.
**Terminal Section (Flared)**

- Flared design for aesthetic purposes.
- Dimensions and tolerances specified.

**Terminal Section (Connector)**

- Recessed or flared design for connection purposes.
- Matching slots and dimensions for seamless installation.

**W-Beam Rail Section**

- Illustrated with detailed dimensions and bolt slots.

**W-Beam Rail Splice**

- Diagram showing splice details and bolt placement.

**Thrie Beam Terminal Section (Connector)**

- Illustrated with detailed dimensions and bolt slots.

**Retroreflective Tab**

- Note on tab manufacture and specifications.

**Thrie Beam Detail**

- Illustrated with detailed dimensions and bolt slots.

**Bolts and Nuts**

- Specifications for AASHTO AGC ARTBA standard numbers.

**W-Beam Rail & Terminal Sections**

- Matched slots and dimensions for rail and terminal sections.

**Base Plate**

- Dimensions and tolerances specified.

**Other Fasteners**

- Rectangular washers and other fittings specified.

**Corrosion-Resistant Steel**

- Galvanized steel specified for corrosion resistance.

**Above Ground Joint Protection**

- Specifications for protection above ground.
NOTES

1. THE MGS TRANSITION FROM A TYPE 3 GUARDRAIL SHALL BE COMPLETED OUTSIDE THE MGS END ANCHORAGE LIMITS.

GUARDRAIL TYPE 3 MGS MGS TRANSITION ------------------------- MGS -------------------------- 25'-0" ----------------------------- 6'-3" ------------- 6'-3" ------------- 6'-3" ---------3'-1½" ----- 3'-1½" -----

GROUND LINE

TRANSITION FROM 28 INCH GUARDRAIL TO 31 INCH MGS

ELEVATION VIEW

ALTERNATE PLAN VIEW - ALIGNMENT TAPER

PLAN VIEW
SEE TYPE 3B (RUB RAIL) PLAN VIEW FOR ALIGNMENT. THE 100 FT. FLARE LENGTH MAY BE SHORTENED IF THE SLOPE IS LESS THAN 8 FT. WIDE.

END ANCHORAGE TYPE 3B (WITHOUT ROADSIDE DITCH AT GUARDRAIL)

SECTION A-A

TYPE 3B ANCHOR BLOCK DETAIL

TYPE 3D HARDWARE DETAILS

END ANCHORAGE TYPE 3B (RUB RAIL) (WITH ROADSIDE DITCH AT GUARDRAIL)

END ANCHORAGE TYPE 3D DEPARTURE TERMINAL

NOTE: ALL PARTS SHALL BE GALVANIZED
1. Post offset dimensions are given to the center of the traffic face of posts.
2. The guardrail between post 1 thru 4 is on a straight line flare.

**NOTES**

1. The end anchorage (flared) shall be the MASH Fleet Terminal, as manufactured by Road Systems Inc. (Telephone #: 432-263-2435). One end anchorage (flared) shall include all post, rail, and all hardware items required for a complete unit. The end anchorage (flared) shall be installed conforming to the manufacturer's recommendations. The contractor shall provide a copy of the manufacturer's installation instructions and parts list to the engineer prior to installation of the device.
2. Retroreflectors tabs shall not be used on end anchorage posts.
3. Delineation shall be applied to the end piece, and shall not be paid for separately but shall be included in the work.
4. Aesthetic treatment options may be available with prior approval of the project engineer. Contact the manufacturer for approved aesthetic treatment options.
5. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
6. The lower sections of the posts 1, 2, and 3 shall not protrude more than 4 inches above the ground (measured along a 5 foot cord). Site grading may be necessary to meet this requirement.
7. The lower sections of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
8. When competent rock is encountered, a 12 inch dia. post hole, drilled 20 inches deep into the rock surface shall be used if approved by the engineer for posts 1 and/or 2. Gravel material shall be placed in the bottom of the hole, approximately 2.5 inches deep to provide drainage. The first and/or second post shall be field cut to length, placed in the hole and backfilled with suitable backfill. The soil plate may be trimmed if required.
9. The breakaway cable assembly shall be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.

**DETAIL A**

**DETAIL B**

**SECTION A-A**

**SECTION B-B**

**MASH TERMINAL**

(Project Certification)
NOTES

1. PAYMENT FOR THE ADDED EMBANKMENT (APPROXIMATELY 45 CU. YDS.) FOR THE FLARE SHALL BE AS FOLLOWS:

   a. UNDER PAY ITEM 203 WHEN THE CONTRACT PLAN INCLUDES PAY ITEM 203
   b. INCLUDED IN THE COST OF THE END ANCHORAGE (FLARED) WHEN THE CONTRACT PLANS DO NOT INCLUDE PAY ITEM 203. THE ADDED EMBANKMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH SUBSECTION 203.05, ANCHORS 1 & 2.

2. WHEN THE WIDENED AREA IS PAVED, PAYMENT FOR THE PAVEMENT (APPROX. 70 SQ. YDS.) SHALL BE AS FOLLOWS:

   a. UNDER PAY ITEM 403 DR 412 WHEN THE CONTRACT PLAN INCLUDES PAY ITEM 403 DR 412
   b. INCLUDED IN THE COST OF THE END ANCHORAGE (FLARED) WHEN THE CONTRACT PLAN DOES NOT INCLUDE PAY ITEM 403 DR 412 (SEE SHEET 1, NOTE 2 FOR PAYMENT TYPES)

3. CONCRETE PAVED AREAS SHALL HAVE THEIR TAPERED ENDS SQUARED OFF AS DIRECTED BY THE ENGINEER.

4. WHEN OVERLAY PAVING, THE FINISHED SURFACE AT EACH POST SHALL NOT BE ABOVE THE TOP BREAKAWAY HOLE OR STRUT ASSEMBLY. THE WIDENED AREA AT THE FLARED END ANCHORAGE SHOULD NOT BE OVERLayed UNLESS PAVEMENT CONDITIONS WARRANT IT.

5. SEE SHEETS 1, 2, 3, AND 5 FOR STANDARD TYPE 3 GUARDRAIL INSTALLATION DETAILS.

6. WIDENING FOR END ANCHORAGES SHALL BE PAVED ON INTERSTATES AND FREEWAYS.

7. INLETS OR RUNDOWNS MAY BE USED INSTEAD OF THE GUTTER IF SPECIFIED ON THE PLANS. NO ADDITIONAL CURB SHALL BE ADDED IN THE VICINITY OF THE END ANCHORAGE.

8. 4:1 OR FLATTER SLOPES IN THE TRAVERSABLE AREA SHALL BE USED BEHIND THE GUARDRAIL, AND IN ADVANCE OF POSTS. IF THIS IS NOT POSSIBLE, A MINIMUM 30 SLOPE MAY BE USED IF APPROVED BY THE ENGINEER.

9. THE WIDENED AREA, EXCEPT FOR CURB OPTION A, SHALL HAVE THE SAME GRADING AS THE ADJACENT SHOULDER/END CURB OR FLATTER IF MORE THAN 2 FT. FROM SHOULDER OR SLOPE EQUAL TO ROADWAY SLOPE IF 2 FT. OR LESS FROM SHOULDER.

10. WIDENING FOR END ANCHORAGES SHALL BE PAVED ON INTERSTATES AND FREEWAYS. FOR OTHER HIGHWAYS, PAVING SHALL BE AS SHOWN ON THE PLANS.

PLAN VIEW WIDENING FOR END ANCHORAGE (FLARED) WITH CURB OPTION A

PLAN VIEW WIDENING FOR END ANCHORAGE (FLARED) WITH CURB OPTION B

PLAN VIEW WIDENING FOR END ANCHORAGE (FLARED)
NOTES FOR NONFLARED

1. THE END ANCHORAGE (NONFLARED) SHALL EITHER BE THE SOFTSTOP AS MANUFACTURED BY TRINITY INDUSTRIES, INC. (TEL.#: 1-888-356-2363), OR THE MAX-TENSION AS MANUFACTURED BY LINDSAY TRANSPORTATION SOLUTIONS (TEL.#: 402-829-6800), OR THE MSKT AS MANUFACTURED BY ROAD SYSTEMS, INC. (TEL.#: 432-263-2435). THE END ANCHORAGE (NONFLARED) SHALL INCLUDE ALL POST, RAIL, AND HARDWARE ITEMS REQUIRED FOR A COMPLETE UNIT. THE END ANCHORAGE (NONFLARED) SHALL BE INSTALLED CONFORMING TO THE MANUFACTURER’S RECOMMENDATIONS. THE CONTRACTOR SHALL PRODUCE A COPY OF THE MANUFACTURER’S INSTALLATION INSTRUCTIONS AND PARTS LIST TO THE ENGINEER PRIOR TO THE INSTALLATION OF THE DEVICE.

2. DO NOT ATTACH THESE END ANCHORAGES DIRECTLY TO A RIGID BARRIER (EX. CONCRETE BARRIER, STEEL BARRIER, CONCRETE STRUCTURE) WITHOUT A PROPER TRANSITION.

3. CONNECTIONS TO W-BEAMS WHERE THE SPLICE IS NOT AT MID-SPAN BUT AT A POST CAN BE MADE USING A 3-1/2" OR 5"-7/8" W-BEAM PANEL DOWNSTREAM OF TRAFFIC.

4. FOR MSKT END ANCHORAGES (NONFLARED), USE THE MANUFACTURER’S SPECIFIED STEEL FOUNDATION TUBES FOR POSTS 1 AND 2.

5. RETROREFLECTOR TABS SHALL NOT BE USED ON END ANCHORAGE POSTS.

6. DELINERATION SHALL BE APPLIED TO THE END PIECE AND SHALL NOT BE PAID FOR SEPARATELY BUT BE INCLUDED IN THE COST OF THE WORK. SEE STANDARD PLAN S-412-L.

END ANCHORAGE (NONFLARED)

SOFTSTOP TERMINAL END ANCHORAGE (NONFLARED) (MASH CERTIFIED)
1. Payment for the added embankment (approximately 1 cu. yds.) for the flare varies traversable embankment slope shall be as follows:

   A. Under Pay Item 203 when the contract plan includes Pay Item 203.
   B. Included in the cost of the end anchorage (nonflared) when the contract plan does not include Pay Item 203. The added embankment shall be constructed in accordance with subsection 310.5.1, ASHTO T 99.

2. When the widened area is paved, payment for the pavement (approx. 39 sq. yds.) shall be as follows:

   A. Under Pay Item 403 or 412 when the contract plan includes Pay Item 403 or 412.
   B. Included in the cost of the end anchorage (nonflared) when the contract plan does not include Pay Item 403 or 412, see Sheet 1 Note 2 for payment types.

3. When overlay paving, the finished surface at each post shall not be above normal shoulder edge line

4. See sheets 1, 2, 3, and 5 for standard type 3 guardrail installation details.

5. The cost of the gutter will be paid for as "Gutter Type 2 (3 ft)" for a length of 111 ft., or "Gutter Type 2 (2 ft)" for a length of 50 ft.

6. Inlets or runnocks may be used instead of the gutter if specified on the plans.

7. Gutter Type 2 (3 ft) wide (see Note 5)

8. The widened area, except for curb option A, shall have the same grading as beneath the adjacent (guardrail) 31 or flatter if more than 2 ft. from shoulder, or slope equal to roadway slope or 2 ft., or less from shoulder.

9. Widering for end anchorages shall be paved on interstates and freeways. For other highways, paving shall be as shown in the plans.
1. The median terminal shall be the max-tension median as manufactured by By Barrier System by Lindsay Transportation Solutions (Tel: 888-800-3691).
2. The max-tension shall be applied directly to W-beam guardrail systems as or transitioned to B, B with panels and post spacing configured at mid-span splice. Transitions to strong post W-beam guardrail systems or other barriers where the splice is not mid-span shall be accomplished using a 3 ft. 1-1/2 inch, 9 ft. 4-1/2 inch or 15 ft. 7-1/2 inch panels after the max-tension system (50 ft. downstream of the first post).
3. Transitions to other barrier systems shall also be at a min. of 50 ft. downstream from the first post. See sheet 4.
4. The max-tension shall not be attached directly to rigid barriers such as concrete barriers, steel barriers or concrete structures without proper transition if rock or stiff soil is encountered, the posts and soil anchor may be installed by auguring and backfilling the hole.
5. Either 8 inch or 12 inch composite or timber blockouts shall be used per manufacturer's recommendations.
6. Either 12 ft-6 inch or 25 foot panels shall be used depending on site conditions or connected barrier systems.
7. Rail panels shall be lapped per manufacturer's installation manual, regardless of an upstream or downstream end system position.
8. Rail panels shall be lapped per manufacturer's installation manual.
9. Unless otherwise specified on the plans, the median terminal shall be installed for bidirectional traffic application.
10. Each installation shall be supervised and certified as correct upon completion by a representative of the device manufacturer or by an employee of the contractor who is a certified installer. The certified installer shall have completed device training and shall be registered with the manufacturer as a certified installer.
11. Delineation, if required, shall be applied to the end piece and will not be paid for separately but shall be included in the cost of the work. See standard plan 5-022-1.
NOTES

1. TRANSITION TYPE 3G IS FOR USE AT BOTH ENDS OF BRIDGES ON TWO-WAY HIGHWAYS AND AT THE APPROACH END OF BRIDGES ON ONE-WAY HIGHWAYS.

2. TRANSITION TYPE 3H IS FOR USE AT THE TRAILING END OF BRIDGES ON ONE-WAY HIGHWAYS.

3. THE THRE BEAM SECTION IN TRANSITION TYPES 3G AND 3H MAY BE SHAPED TO FIT CORRESPONDING RADIUS CURVES. HOWEVER, THE 6 FT-3 IN. TRANSITION SECTION SHALL NOT BE BENT.

4. A TRANSITION SHALL BE REQUIRED BETWEEN TYPES 3G OR 3H AND THE BRIDGE RAILS SEE STANDARD PLAN M-606-15 FOR THE TRANSITION TO TYPE 9 GUARDRAIL BARRIER.

5. TRANSITION TYPES 3G AND 3H ARE BOTH MASH COMPLIANT.

6. CURB TYPE 6 MAY BE ASPHALT DR CONCRETE. THE COST OF CURB IS INCLUDED IN THE WORK, UNLESS A SEPARATE PAY ITEM IS INCLUDED IN THE BID SCHEDULE.

7. TRANSITION TYPES 3G AND 3H ARE BOTH MASH COMPLIANT.

8. TRANSITION TYPES 3G AND 3H ARE BOTH MASH COMPLIANT.

9. TRANSITION TYPES 3G AND 3H ARE BOTH MASH COMPLIANT.

10. TRANSITION TYPES 3G AND 3H ARE BOTH MASH COMPLIANT.
NOTES
1. APPLICATION: THE TRANSITION TYPE 3J MAY BE USED TO SHIELD HAZARDS AT THE INTERSECTION OF TWO ROADWAYS. TYPICAL APPLICATIONS INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING: A CANAL SERVICE ROAD AT BRIDGE ENDS, B INTERSECTIONS IN GUARDRAILS BY INTERSECTING ROADWAYS, ETC.


3. THE RAIL IS NOT BOLTED TO THE CRT POST AT THE CENTER OF THE CURVE FOR THE 8 FT.-6 IN., 17 FT., AND 25 FT.-6 IN. RADII. PLATES SHALL BE IN ACCORDANCE WITH SHEET ONE OF THIS STANDARD. MAXIMUM FILL SLOPE SHALL BE 2:1.

4. THE ¾ IN. GALVANIZED WIRE ROPE (CABLE) SHALL CONFORM TO ASH 38 & 39, AND THE STRUCTURAL TUBING TO ASTM A 35. THE STEEL TUBE MAY BE DRIVEN WITH WOOD POST INSERTED IF DAMAGE OCCURS TO THE STEEL TUBE. THE STEEL TUBE MAY BE SELECTED UPSIDE DOWN, BUT SHALL MEET ALL REQUIREMENTS OF THE AMERICAN WELDING SOCIETY.

5. ALL STRUCTURAL STEEL SHALL BE GALVANIZED IN CONFORMANCE WITH ASTM A 123. ALL STRUCTURAL STEEL SHALL NOT BE PUNCHED, GRILLED, CUT, OR WELDED AFTER GALVANIZING.

6. OUTSIDE NUT SHALL BE TORQUED AGAINST INSIDE NUT WITH THE CABLE INSTALLED TAUT BETWEEN THE ANCHOR PLATE AND FIRST POST.

7. THE STEEL TUBE MAY BE MAINTAINED FREE OF FIXED OBJECTS, 2:1 MAX. SLOPE PERMITTED.

8. ALL CURVED GUARDRAIL SHALL BE SHOP BENT.

9. ALL CURVED GUARDRAIL SHALL BE SHOP BENT.

10. SEE SHEET 5 FOR ANCHOR PLATE AND OTHER DETAILS.

11. THE STEEL TUBE MAY BE DRIVEN WITH WOOD POST INSERTED IF NO DAMAGE OCCURS TO THE POST OR BOLTS.
**Obstructions in Medians**

Guardsrail for obstruction in medians wider than 30 ft. Note: For obstructions that are wider than 20 ft. in medians use sheet 16.

**Guardsrail System (MGS)**

**Type 3 W-Beam 31 Inches**

**Midwest**

Issued by the Project Development Branch: July 31, 2019

**Computer File Information**

- Creation Date: 07/31/19
- Designer Initials: JBK
- Last Modification Date: 03/05/20
- Detailer Initials: LT A
- CAD Ver.: MicroStation V8
- Scale: Not to Scale
- Units: English

**Narrow Median Detail**

- Usually less than 30 ft. wide median
- With all paved surface

**Grading for Median Obstruction**

Pay as two lengths of guardsrail type 3.

**Obstructions in Medians**

- Pay for as transition type 30 rail and block for double face. See sheet 1 for details. Pay includes extra single three beam rail on traffic departing side. Use nested (double) three beam conforming to transition type 30 on approach side.

**Computer File Information**

- Date: Comments
NOTES

1. MEDIAN BARRIERS TANGENT TO THE ROADWAY MAY BE USED WHERE THE SHOULDER SLOPES IN THE MEDIAN ARE STEEP.

2. BARRIER LENGTHS SHALL BE INCREASED TO ACCOUNT FOR STEEP EMBANKMENTS OR OTHER HAZARDS WITHIN CLOSE PROXIMITY OF BRIDGES.

@ — DO NOT CONSTRUCT THE TR AND GUARDRAIL ON THE TRAILING BRIDGE ENDS IF SITE CONDITIONS DO NOT WARRANT THE USE OF GUARDRAIL.

N — SHOWN ON PLANS LENGTH TO SHIELD ALL HAZARDS IS BASED ON GUARDRAIL'S LENGTH OF NEED COMPUTATION. SEE AASHTO ROADWAY DESIGN GUIDE. THE MINIMUM SHALL BE 3 FT. - 6 IN. WHERE SITE CONDITIONS ALLOW THE TOTAL LENGTH OF NEED WILL INCLUDE THE LENGTH OF TRANSITION, THE LENGTH OF RAIL, AND ANY RESPECTIVE LENGTH IN THE RAIL END TREATMENT.

TR — 25 FEET FOR TRANSITION TYPES 3G AND 3H.

A — EDGE OF 8 FT. OR 10 FT. SHOULDER.

B — EDGE OF 6 FT. OR LESS SHOULDER.

★ — END ANCHORAGE CAN BE FLARED OR NONFLARED.

MULTILANE DIVIDED HIGHWAYS FOR STEEP EMBANKMENTS IN MEDIAN

MIDWEST GUARDRAIL SYSTEM (MGS)
TYPE 3 W-BEAM 31 INCHES

STANDARD PLAN NO. M-606-1
Standard Sheet No. 14 of 19

Computer File Information
Creation Date: 07/31/19
Designer Initials: JBK
Last Modification Date: 03/05/20
Detailer Initials: LA

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Project Development Branch: July 31, 2019
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Sheet Revisions
Date: Comments

M-606-1 Standard Sheet No. 14 of 19

CAD Ver: MicroStation V8i Scale: Not to Scale Units: English

Project Sheet Number:
*END ANCHORAGE LENGTH AND FLARE RATES VARY BY DEVICE. SEE MANUFACTURER/SUPPLIER FOR INSTALLATION REQUIREMENTS.

MEDIAN, M SLOPE VARIES

GUARDRAIL TRANSITIONS FROM PARALLEL TO ROADWAY SHOULDER AT 3G SEGMENT TO 15:1 TAPER WITHIN 25 FEET BASED ON POST OFFSET DIMENSIONS SHOWN.

NOTES

1. GUARDRAIL TRANSITIONS FROM PARALLEL TO ROADWAY SHOULDER AT 3G SEGMENT TO 15:1 TAPER WITHIN 25 FEET BASED ON POST OFFSET DIMENSIONS SHOWN.

2. SEE SHEET 14 FOR THE RIGHT SHOULDER GUARDRAIL LAYOUT.

MULTILANE DIVIDED HIGHWAYS - (DEPRESSED MEDIANS, 60 FT. AND OVER WITH OPEN HAZARDS OR OBSTRUCTIONS)
1. Guardrail transitions from parallel to roadway shoulder at 3G segment to 15:1 taper within 25 feet based on post offset dimensions shown.

2. The Option 1 layout shall be used when "Y" exceeds 16 feet or when median barrier is continuous.

3. The Option 2 layout shall be used when "Y" exceeds 16 feet or when median barrier is continuous.

4. See Sheet 14 for right shoulder guardrail layout.

--- TRANSITION TO TYPICAL 15:1 TAPER ---

MULTILANE DIVIDED HIGHWAYS - (DEPRESSED MEDIANS, 21 - 59 FT. WITH OPEN HAZARDS OR OBSTRUCTIONS)
1. A TYPE 3G OR SH TRANSITION (SEE SHEET 12) SHALL BE USED TO CONNECT THE TYPE 3 W-BEAM TO A TYPE 9 CONCRETE BARRIER (SEE M-606-15) OR TO A TYPE B OR 20 BRIDGE RAIL.

2. "TR" SHALL BE 25 FEET FOR THE TRANSITION TYPES 3G AND 3H.

3. THE GUARDRAIL LENGTH DIMENSION "N" IS THE LENGTH AS DETERMINED BY THE LENGTH OF NEED COMPUTATION AND IS SHOWN ON THE PLANS. THE MINIMUM IS 12 FT.-6 IN. WHERE SITE CONDITIONS ALLOW, THE OVERALL REQUIRED LENGTH OF NEED CAN INCLUDE THE LENGTH OF TRANSITION, THE LENGTH OF RAIL (N), AND ANY REDIRECTIVE LENGTH IN THE RAIL END TREATMENT. A TRAVERSABLE SLOPE SHALL BE PROVIDED BEHIND THE TERMINAL TO DIMENSION "N" PRIOR TO THE OBSTRUCTION UNLESS OTHERWISE APPROVED BY THE ENGINEER.

NOTES

GUARDRAIL FOR ROADSIDE OBSTRUCTIONS

GUARDRAIL FOR ROADSIDE FILL CONSTRUCTION

GUARDRAIL FOR ROADSIDE CUT-TO-FILL CONDITION

LAYOUT FOR DRIVEWAY APPROACH

NARROW BRIDGE

SHAPE CHANGE FROM BRIDGE TO ROADWAY

2-WAY NORMAL BRIDGE APPLICATION

INTERRUPTED STRUCTURE APPROACH

USE IN IF THIS LOCATION IS ON DRIVEWAY OR LOW SPEED SERVICE ROAD

GUARDRAIL SYSTEM (MGS)

MIDWEST

STANDARD PLAN NO.

M-606-1

TYPE 3 W-BEAM 31 INCHES

Project Development Branch

JBK

Issued by the Project Development Branch: July 31, 2019

Project Sheet Number: 17 of 19
NOTES

1. POSTS ①, ②, ④, and ⑤ MAY BE TIMBER OR STEEL.
2. THE NUMBER OF OMITTED POSTS IS DEPENDENT ON THE LENGTH OF THE GAP.
3. ONE POST MAY BE OMITTED WITHOUT ANY MODIFICATION TO THE GUARDRAIL RUN.

LONG-SPAN RAILING FOR ONE, TWO, OR THREE OMITTED POSTS AT GAP

TIMBER POST
POSTS ①-② AND ③-⑩ (SEE NOTE 1)

STEEL POST
POSTS ①-② AND ③-⑩ (SEE NOTE 1)

BREAKWAY TIMBER POST
POSTS ③-⑤

MIDWEST
GUARDRAIL SYSTEM (MGS)
TYPE 3 W-BEAM 31 INCHES

Issued by the Project Development Branch: July 31, 2019
Project Sheet Number: Standard Sheet No. 18 of 19
1. Location and length of median guardrail approaches to culverts with full headwall and wingwalls shall be as shown for bridges on sheet. The guardrail type 3 shall continue across the culvert as shown on this sheet.

2. Right shoulder box culvert treatment is shown on this sheet for culverts 20 ft. or less in length.

3. Construction and payment for fill heights shall be included in the cost of the guardrail type 3.

4. Anchorages D. Six bolts for base plate D with inside mount. The bolts shall be 7/8 in. dia x 10 in. high strength rods threaded full length and all galvanized. Rods shall be cast-in-place for new structures. For existing structures, the rods shall be installed in 1-1/4 in. dia holes with non-shrink grout or epoxy conforming to ASTM C 881. If the thickness of a culvert's top panel requires bolts to be less than 10 in. high, the bolts shall be approved by the engineer.

5. The guardrail length dimension N is the length as determined by the length of need computation and is shown on the plans. The minimum is 12 ft.-6 in. where site conditions allow. The overall required length of need can include the length of transition, the length of rail only, and any redirective length in the rail end treatment.

6. All posts, base plates, and anchor bolts shall be fabricated from ASTM A 36 steel. The above material, W-beam, and all anchor bolts and miscellaneous bolts, nuts, and washers shall be galvanized after fabrication in accordance with Sections 601, 602, and 509, respectively.

7. Post anchors, encased in concrete, shall be ASTM 498 steel and need not be galvanized.

8. Prior to installation of guardrail on culverts, three sets of working drawings which comply with the requirements of Section 105 shall be submitted to the engineer for information only.

NOTES
**PRECAST TYPE 7 CONCRETE BARRIER**

1. PRECAST TYPE 7 CONCRETE BARRIER HAS BEEN CLASSIFIED AS TL-3 MASH COMPLIANT MANUFACTURING AND UTILIZATION OF PRECAST TYPE 7 CONCRETE BARRIER IS PERMITTED FOR ALL COOT PROJECTS REQUIRING TL-3 MASH COMPLIANT TEMPORARY CONCRETE BARRIER REFER TO COSTS APPROVED PRODUCT LIST (APL) FOR ADDITIONAL MASH COMPLIANT PROPRIETARY TEMPORARY BARRIER DEVICES.

2. ALL STEEL REINFORCING SHALL BE 2 IN CLEAR OF THE NEAREST SURFACE OF CONCRETE UNLESS OTHERWISE SHOWN. REINFORCING STEEL SHALL BE GRADE 43 MINIMUM.

3. CONCRETE SHALL BE CLASS D.

4. ALL PERMANENT PRECAST BARRIERS USED TO REPLACE OTHER PRECAST TYPE 7 CONCRETE BARRIERS SHALL BE IN NEW CONDITION, UNDAMAGED, AND WITH NO REPAIRS.

5. FOR TEMPORARY INSTALLATIONS, INSTALL WITH A MINIMUM 4 FT DISTANCE FROM THE CENTERLINE OF THE PRECAST TYPE 7 CONCRETE BARRIER TO ANY OBSTRUCTIONS BEING IT FOR TEMPORARY INSTALLATIONS WITH LESS THAN A 4 FT MINIMUM DISTANCE, STABILIZATION PINS SHALL BE USED ON EACH PRECAST TYPE 7 CONCRETE BARRIER UNIT ADJACENT TO AND WITHIN 5 FT OF BOTH SIDES OF THE OBSTRUCTION SEE SHEET 3 FOR STABILIZATION PINNING DETAILS.

6. THE FLARE RATE FOR TEMPORARY INSTALLATIONS SHALL BE 10:1 OR FLATTER UNLESS OTHERWISE APPROVED BY THE ENGINEER FOR PERMANENT INSTALLATIONS SEE THE FLARE RATES TABLE ON STANDARD M-606-13 SHEET 3.

7. STABILIZATION PINS SHALL BE USED TO ANCHOR EACH 10 FT UNIT IN ALL PERMANENT INSTALLATIONS SEE SHEET 3 FOR STABILIZATION PINNING DETAILS.

8. FOR ALL PERMANENT INSTALLATIONS THAT REQUIRE END ANCHORAGES SEE STANDARD PLAN M-606-13 SHEET 3 FOR ANCHORAGE DETAILS.

9. THE MONTH AND YEAR THE PRECAST TYPE 7 CONCRETE BARRIER WAS MANUFACTURED SHALL BE MOLDED INTO ONE END OF EACH 10 FT BARRIER UNIT.

10. APPROVED NON-SHRINK GROUT SHALL BE USED FOR GROUTING OVER ALL PINS AND GROUTING OF SCUPPERS.

11. WHEN HYDRAULIC ANALYSIS ALLOWS, SCUPPERS MAY NOT BE NEEDED ON:

   A. MEDIANS INSTALLATION WITH INLET DRAINAGE.

   B. PRECAST TYPE 7 CONCRETE SHOULDER BARRIER ON HIGH EDGE OF A SUPERELEVATED SHOULDER.

   C. PRECAST TYPE 7 CONCRETE MEDIAN BARRIER ON A CREST VERTICAL CURVE.

   D. PERMANENT BARRIER, IF SPECIFIED ON PLANS.

12. ALL INCIDENTAL WORK AND MATERIALS SUCH AS CONNECTING PINS, ANCHORS BOLTS, GROUT, AND EXCAVATION FOR END ANCHORAGES WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE COST OF THE WORK.

13. ONE IN DIAMETER THREADED INSERTS MAY BE CAST-IN-PLACE TO FACILITATE LIFTING FOR THE TEMPORARY PRECAST TYPE 7 CONCRETE BARRIER APPLICATIONS ONLY.

14. RETROREFLECTORIZATION IS REQUIRED ON PRECAST TYPE 7 CONCRETE BARRIERS, SEE CONCRETE BARRIER RETROREFLECTOR NOTES ON STANDARD PLAN S-612-1.

**SECTION A-A**

- DIMENSIONS MARKED ARE TO THE INTERSECTION POINT OF THE BARRIER SLOPES CONSTRUCTED TO PROVIDE A SMOOTH TRANSITION BETWEEN THE SLOPES.

- STIRRUP "M" *5 REBAR PAIR

**SECTION B-B**

- ELEVATION

**SECTION C-C**

- 8" CONTINUOUS KEYWAY

**GENERAL NOTES**

- *** (DIMENSIONS MARKED ARE TO THE INTERSECTION POINT OF THE BARRIER SLOPES CONSTRUCTED TO PROVIDE A SMOOTH TRANSITION BETWEEN THE SLOPES.)

**NARROW BASE SHOULDER BARRIER**

**STANDARD PLAN NO.**

- M-606-14

**STANDARD SHEET NO.**

- 1 of 4
NOTES

1. WASHERS SHALL BE FORGED AS AN INTEGRAL PART OF THE PIN OR SHALL BE WELDED AS SHOWN.

2. PINS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION.

3. IF AN ALTERNATIVE TOP CONFIGURATION IS USED FOR LIFTING, THE LIFTING PIN SHALL BE PROVIDED. PINS SHALL CONFORM TO CRITICAL DIMENSIONS (PIN LENGTH DIAMETER).

4. PINS SHALL CONFORM TO ASTM A449.

5. APPROVED NON-SHRINK GROUT SHALL BE USED FOR GROUTING OVER ALL PINS AND GROUTING OF SCUPPERS.

6. BOTH ENDS OF THE TYPE 7 CONCRETE BARRIER SHALL HAVE A 241° TAPER IN EACH DIRECTION FROM THE CENTER PIN RECESS TO ITS OUTER EDGE TO FACILITATE PLACEMENT ON CURVES.

7. JOINTS BETWEEN CAST-IN-PLACE GUARDRAIL TYPE 7 AND PERMANENT INSTALLATION PRECAST TYPE 7 CONCRETE BARRIER SHALL INCLUDE ALL REGRESSES AND LOOPS IN THE CAST-IN-PLACE END, ALONG WITH THE PIN TO COMPLETE THE TYPICAL PRECAST TYPE 7 CONCRETE BARRIER JOINT.

DETAILS FOR PIN AND LOOP CONNECTION

1. A PIN BY 12" IN TAPER IS REQUIRED AT THE BOTTOM OF ALL FOUR CORNERS OF THE PRECAST TYPE 7 CONCRETE BARRIER SECTIONS TO ELIMINATE SNAGGING OF SNOW PLOW BLADES. THE TAPER IS OPTIONAL ON PERMANENT INSTALLATIONS.

2. THE HORIZONTAL SLOTS SHALL BE 6½ IN DEPTH AT THE CENTER OF THE PRECAST TYPE 7 CONCRETE BARRIER AND MAY DECREASE IN DEPTH AT THE EDGE OF THE BARRIER UNIT DUE TO THE 241° TAPER.
NOTES
1. SEE SHEET 1 FOR REINFORCEMENT AND OTHER DETAILS NOT SHOWN HERE.
2. PINS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION
3. FOR TERMINAL ANCHORING OF THE PERMANENT INSTALLATION OF PRECAST TYPE 7 CONCRETE BARRIERS, SEE THE END ANCHORAGE DETAIL ON STANDARD PLAN M-606-13, SHEET 1.
4. AN OPTIONAL 3 IN MAXIMUM TAPERED END POINT MAY BE PROVIDED ON THE STABILIZATION PIN TO FACILITATE DRIVING.

TABLE OF STABILIZATION PIN LENGTHS

<table>
<thead>
<tr>
<th>ROAD SURFACE</th>
<th>PIN LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCRETE</td>
<td>2 FT-6 IN.</td>
</tr>
<tr>
<td>HMA</td>
<td>3 FT.</td>
</tr>
<tr>
<td>SOIL</td>
<td>3 FT-6 IN.</td>
</tr>
</tbody>
</table>

ELEVATION VIEW WITH PINS

DETAILS FOR STABILIZATION OF PERMANENT OR TEMPORARY PINNED PRECAST TYPE 7 CONCRETE BARRIER

PLAN VIEW OF S BAR ENDS

STABILIZATION PIN

OPTIONAL TAPERED END PIN

FILL RECESS WITH GROUT AFTER PLACING PIN.

STABILIZATION PIN THROUGH SURFACING INTO SUBGRADE.

DRILLED HOLES REQUIRED FOR CONCRETE Pavement.

USE 2 PINS FOR EACH END, EACH UNIT.

ROAD SURFACE PIN LENGTH

CONCRETE 2 FT-6 IN.

HMA 3 FT.

SOIL 3 FT-6 IN.

TABLE OF STABILIZATION PIN LENGTHS

RECESS TO BE 3 IN WIDTH (TYP.)

7 1/2 IN.

4 IN.

3 1/2 IN. DIA.

4 IN.

FORM HOLE FOR PIN WITH 1/2 OD PVC PLASTIC PIPE (TO BE LEFT IN PLACE)

3 1/2 IN.

T DIA. PIN (SEE NOTE 2)

T DIA. PIN

3 IN.

MAX.

1 1/2 IN.

2 IN.

4 IN.

2 1/2 IN.

1 IN.

4 IN.

ELEVATION VIEW WITH PINS

DETAILS FOR STABILIZATION OF PERMANENT OR TEMPORARY PINNED PRECAST TYPE 7 CONCRETE BARRIER

PLAN VIEW OF S BAR ENDS

STABILIZATION PIN

OPTIONAL TAPERED END PIN

FILL RECESS WITH GROUT AFTER PLACING PIN.

STABILIZATION PIN THROUGH SURFACING INTO SUBGRADE.

DRILLED HOLES REQUIRED FOR CONCRETE Pavement.

USE 2 PINS FOR EACH END, EACH UNIT.
NOTES

1. PRECAST TYPE 7 CONCRETE BARRIERS SHALL BE USED ONLY IN TEMPORARY CONFIGURATIONS AND MUST BE INSPECTED PRIOR TO REUSE AND PLACEMENT IN WORK ZONES. CONTINUED USE IN WORK ZONES IS ALSO SUBJECT TO PERIODIC INSPECTIONS. INSPECTIONS AND MEASUREMENTS WILL BE PERFORMED BY CDOT. ANY PRECAST TYPE 7 CONCRETE BARRIER SHOWING ANY ONE OF THE FOLLOWING DISCREPANCIES WILL NOT BE INSTALLED OR ALLOWED TO REMAIN IN USE:

   a. A SLOT CONNECTION WHERE MORE THAN 25% IS EITHER CRACKED OR MISSING.
   b. A CRACK ON TOP OF A BARRIER UNIT WHICH RUNS DOWN THE VERTICAL FACE ON EITHER SIDE FOR MORE THAN 16 INCHES.
   c. A CHIP ON THE TOP OR VERTICAL FACE WHICH IS MORE THAN 1 SQUARE FOOT IN AREA AND MORE THAN 2 INCHES DEEP. SMALLER AREAS AND DEPTHS SHALL BE FIELD PATCHED. CHIPS LESS THAN 2 INCHES DEPTH AND WITHIN A REASONABLE AREA SHALL NOT REQUIRE ATTENTION.
   d. A HORIZONTAL CRACK ON EITHER SIDE WHICH IS GREATER THAN 1/2, OR THAT Splits INTO A "Y" SHAPE WITH ARMS GREATER THAN 12 INCHES.
   e. A HORIZONTAL CRACK IN THE SLOPING AREA THAT IS GREATER THAN 1/2 AND INTERSECTS A VERTICAL CRACK.
   f. A CHIP ON A VERTICAL CURB GREATER THAN 1 SQUARE FOOT AND/OR 3 INCHES DEEP. SMALLER AREAS AND DEPTHS SHALL BE FIELD PATCHED. CHIPS LESS THAN 1 INCH DEPTH AND WITHIN A REASONABLE AREA SHALL NOT REQUIRE ATTENTION.
   g. ANY CORNERS THAT ARE CHIPPED MORE THAN 1 SQUARE FOOT IN AREA AND MORE THAN 2 INCHES DEPTH SHALL BE FIELD PATCHED. CHIPS LESS THAN 2 INCHES DEPTH AND WITHIN A REASONABLE AREA SHALL NOT REQUIRE ATTENTION.
   h. SPALLING CONCRETE THAT IS PITTED, FLAKED, OR BROKEN OFF MORE THAN 5 SQUARE FEET COMBINED (EXPOSED REBAR MAY OR MAY NOT BE VISIBLE).
   i. ANY CORNERS THAT ARE CHIPPED MORE THAN 1 SQUARE FOOT IN AREA AND MORE THAN 2 INCHES DEEP. SMALLER AREAS AND DEPTHS SHALL BE FIELD PATCHED. CHIPS LESS THAN 2 INCHES DEPTH AND WITHIN A REASONABLE AREA SHALL NOT REQUIRE ATTENTION.

2. A "CRACK" IS DEFINED AS AN OPENING OF AT LEAST \( \frac{1}{8} \) INCH IN WIDTH WHEN MEASURED WITH A FEELER GAUGE.

3. ALL PRECAST TYPE 7 CONCRETE BARRIERS SHALL BE IN ACCORDANCE WITH SUBSECTION 606.04(8).
CONCRETE BARRIER STYLE CA

Details similar to style CA except as noted. BARRIER DOWELLED TO CONCRETE SURFACES.

CONCRETE BARRIER STYLE CC

Details similar to style CA except as noted. BARRIER DOWELLED TO CONCRETE SURFACES.

CONCRETE BARRIER STYLE CD

Details similar to style CA except as noted. BARRIER DOWELLED TO CONCRETE SURFACES.

GENERAL NOTES

1. See Sheet 2 for details of concrete barrier style CA end anchor connections to structures or transition to guardrail type T.

2. See Sheet 6 for concrete barrier style CA transitions at bridge columns and sign pedestals in medians.

3. Where glare screens are required use concrete barrier style CG on Sheet 4.

4. Where roadway offset is greater than 1½ inch, use concrete barrier style CE.

5. Barred may be cast-in-place or slip formed.

6. Barrier foundation shall be pavement, or compacted aggregate base, or compacted embankment material.

7. No anchorage is required (Typ.) except for the 10 foot anchorage. See Sheets 2 and 3 for details.

8. Construction joints shall be used on all barrier types shown, at the end of the day's pour or after any interruption longer than 30 minutes. All construction joints shall be thoroughly cleaned before fresh concrete is poured.

9. All reinforcing steel shall be grade 60 epoxy coated deformed bars and shall be a minimum of 2 inches from the nearest concrete surface, unless otherwise noted.

10. Continuous longitudinal reinforcement shall be either grade 60 epoxy coated deformed bars or wire strand with minimum ultimate tensile strength of 28,000 lbs. and class C galvanizing according to ASTM A 603.

11. Transition to existing concrete barrier installations of dissimilar shape shall be accomplished in one 15 foot long segment of barrier.

12. Concrete shall be class D.

13. Additional material for barrier emplacement greater than 3 inch will not be measured and paid for separately but shall be included in the work.

14. Epoxy coated longitudinal rebar shall have a minimum lap splice of 36 inches. Wire strand longitudinal reinforcement shall be butt welded or mechanically spliced to maintain 100 percent of the minimum required tensile strength.

15. All incidental work and material, such as dowels, grout, anchors, bolts, pins, joint material, excavation for bases, continuous longitudinal reinforcement, shall be included in the cost of guardrails.

16. Retroreflectorization is required on all barrier types, see barrier retroreflective notes on standard plan S-612-L.

TRANSVERSE CONTRACTION JOINTS

Formed or sawed transverse contraction joints are required at 20 ft. intervals of the intervals shall match the concrete pavement joints for installations that are on top of the concrete roadway pavement. See concrete barrier style CA for typical dimensions.
NOTES

1. SEE SHEET 3 FOR END ANCHORAGE REQUIREMENTS. AT A MINIMUM, THE BARRIER SHALL BE ANCHORED AT THE ENDS AND AT INTERRUPTIONS WITH THE A 10 FOOT ANCHORAGE. THE ANCHORAGE SHALL BE MONOLITHIC OR CONVEYED WITH 2-#8 X 8' @ 2'-0 BARS.

2. SEE SHEET 1 FOR CONCRETE BARRIER STYLE CA AND STYLE CC.

3. TRANSITION TO EXISTING CONCRETE BARRIER INSTALLATIONS OF DISSIMILAR SHAPE SHALL BE ACCOMPLISHED IN ONE 15 FOOT LONG SEGMENT OF BARRIER.

4. SEE SHEET 6 FOR CONCRETE BARRIER STYLE CA TRANSITIONS AT BRIDGE COLUMNS AND SIGN PEDESTALS IN MEDIANS.

5. FOR STYLE CA CONNECTIONS TO STRUCTURES, SEE THE BRIDGE PLANS.
NOTES

1. SEE PLANS FOR CONCRETE BARRIER LENGTHS LESS THAN 150 FEET AND/OR HINGE WIDTHS
   EQUAL TO OR LESS THAN 3 FEET BEHIND THE CONCRETE BARRIER.

2. SEE SHEET 2 FOR REINFORCING BAR DETAILS.

3. NEW CONCRETE BARRIERS UNDER 150 FEET SHALL BE DOWELED INTO EXISTING
   CONCRETE BRIDGE BARRIERS OR WINGWALLS TO MINIMIZE ROTATIONS TO ANY OF THEM.
   SEE SHEET 1 FOR DOWEL PLACEMENT LAYOUT.

4. FOR END ANCHORAGES UNDER 150 FEET, CONSTRUCT THE ANCHORAGE FOR THE ENTIRE
   LENGTH OF THE CONCRETE BARRIER.

5. FOR CONCRETE BARRIER RUNS GREATER THAN 150 FEET BUT LESS THAN 500 FEET, THE
   RUN SHALL BE ANCHORED AT THE ENDS AND AT GAPS, SUCH AS AN EMERGENCY ACCESS.

6. FOR END ANCHORAGES OVER 500 FEET, CONSTRUCT ANCHORAGES EVERY 250 FEET.

7. REINFORCING STEEL IN ANCHORAGE SHALL BE GRADE 60 EPOXY COATED DEFORMED BARS.

8. CONCRETE SHALL BE CLASS D.

9. ALL INCIDENTAL WORK AND ADDITIONAL MATERIALS SHALL BE INCLUDED IN THE COST OF
   THE CONCRETE BARRIER.

1. SEE PLANS FOR CONCRETE BARRIER LENGTHS LESS THAN 150 FEET AND/OR HINGE WIDTHS
   EQUAL TO OR LESS THAN 3 FEET BEHIND THE CONCRETE BARRIER.

2. SEE SHEET 2 FOR REINFORCING BAR DETAILS.

3. NEW CONCRETE BARRIERS UNDER 150 FEET SHALL BE DOWELED INTO EXISTING
   CONCRETE BRIDGE BARRIERS OR WINGWALLS TO MINIMIZE ROTATIONS TO ANY OF THEM.
   SEE SHEET 1 FOR DOWEL PLACEMENT LAYOUT.

4. FOR END ANCHORAGES UNDER 150 FEET, CONSTRUCT THE ANCHORAGE FOR THE ENTIRE
   LENGTH OF THE CONCRETE BARRIER.

5. FOR CONCRETE BARRIER RUNS GREATER THAN 150 FEET BUT LESS THAN 500 FEET, THE
   RUN SHALL BE ANCHORED AT THE ENDS AND AT GAPS, SUCH AS AN EMERGENCY ACCESS.

6. FOR END ANCHORAGES OVER 500 FEET, CONSTRUCT ANCHORAGES EVERY 250 FEET.

7. REINFORCING STEEL IN ANCHORAGE SHALL BE GRADE 60 EPOXY COATED DEFORMED BARS.

8. CONCRETE SHALL BE CLASS D.

9. ALL INCIDENTAL WORK AND ADDITIONAL MATERIALS SHALL BE INCLUDED IN THE COST OF
   THE CONCRETE BARRIER.

CONCRETE BARRIER END ANCHORAGE UNDER 150 FEET

CONCRETE BARRIER END ANCHORAGE BETWEEN 150 FEET AND 500 FEET

CONCRETE BARRIER END ANCHORAGE OVER 500 FEET
NOTES

1. SEE SHEET 5 FOR DETAILS OF CONCRETE BARRIER STYLE CG/CG END ANCHORS.
   CONNECTIONS TO STRUCTURES AND TRANSITIONS TO GUARDRAIL TYPE 7.

2. WHERE ROADBED OFFSET IS GREATER THAN 3/8 INCH, SEE CONCRETE BARRIER TYPE CGC.

3. BARRIER FOUNDATION SHALL BE PAVEMENT, OR COMPACTED AGGREGATE BASE,
   OR COMPACTED EMBANKMENT MATERIAL.

4. RETROREFLECTORIZATION IS REQUIRED ON ALL BARRIER TYPES. SEE THE BARRIER
   RETROREFLECTOR NOTES ON STANDARD PLAN 5-602-1.

5. FOR SURFACES OFFSETS LESS THAN 3 INCHES, NO ADDITIONAL REINFORCEMENT IS REQUIRED.

6. SURFACE OFFSETS GREATER THAN 3 INCHES WILL REQUIRE ADDITIONAL REINFORCEMENT AS SHOWN.

7. THE LOWER LAYER OF TWO #4 BARS SHALL BE 3 INCHES ABOVE THE BOTTOM OF THE BARRIER.

8. Each vertical increment of 8 inches measured from the lower layer of reinforcement shall include an additional #4.

9. REINFORCING STIRSPUR NOT REQUIRED FOR ROADBED OFFSETS
   LESS THAN 1 FOOT.

10. VARIES FOR SURFACES OFFSETS LESS THAN 36 INCHES, NO ADDITIONAL REINFORCEMENT IS REQUIRED.

11. SURFACE OFFSETS GREATER THAN 36 INCHES WILL REQUIRE ADDITIONAL REINFORCEMENT AS SHOWN.

12. FOR INSTALLATIONS THAT ARE ON TOP OF THE CONCRETE ROADWAY PAVEMENT.

13. SEE CONCRETE BARRIER STYLE CG FOR TYPICAL DIMENSIONS.

14. TRANSVERSE CONTRACTION JOINTS
   FORMED OR SAWN TRANSVERSE CONTRACTION JOINTS ARE REQUIRED AT 20 FT.
   INTERVALS OR THE INTERVALS SHALL MATCH THE CONCRETE PAVEMENT JOINTS
   FOR INSTALLATIONS THAT ARE ON TOP OF THE CONCRETE ROADWAY PAVEMENT.

15. SEE CONCRETE BARRIER STYLE CG FOR TYPICAL DIMENSIONS.
NOTES
1. SEE SHEET 3 FOR END ANCHORAGE REQUIREMENTS AT A MINIMUM,
   THE BARRIER SHALL BE ANCHORED AT THE ENDS AND AT INTERRUPTIONS
   WITH THE 10 FOOT ANCHORAGE. ANCHORAGE SHALL BE MONOLITHIC OR
   DOWELED WITH 2-#8 X 8" @ 2'-0" BARS.
2. SEE SHEET 4 FOR CONCRETE BARRIER STYLE CG AND STYLE CGC.
3. SEE SHEET 9 FOR TRANSITION TO THREE BEAMS.
4. TRANSITION TO EXISTING CONCRETE BARRIER INSTALLATIONS OF DISSIMILAR
   SHAPE SHALL BE ACCOMPLISHED IN ONE 15 FOOT LONG SEGMENT OF BARRIER.
5. SEE SHEET 6 FOR CONCRETE BARRIER STYLE CA TRANSITIONS
   AT BRIDGE COLUMNS AND SIGN PEDESTALS IN MEDIAN.
6. FOR STYLE CG CONNECTIONS TO STRUCTURES, SEE THE BRIDGE PLANS.

TRANSITION CONCRETE BARRIER STYLE CGE/CG TO CONCRETE BARRIER TYPE 7 OR EXISTING
1. THE CONTRACTOR'S OPTIONS FOR FILL BETWEEN CONCRETE BARRIER WALLS:
   A. PLACE 4 INCHES OF POLYSTYRENE AT BASE BETWEEN CONCRETE BARRIER WALLS.
   B. PLACE 1 FOOT OF GRANULAR MATERIAL AT BASE BETWEEN WALLS.
   C. PLACE GRANULAR MATERIAL FROM BASE TO BOTTOM OF 4 INCH CAP.
   D. MONOLITHIC CONCRETE WITH FOAM BLOCKOUTS IS NOT PERMITTED.
2. REINFORCING STEEL SHALL EXTEND CONTINUOUS THROUGH CONSTRUCTION JOINTS.
3. SEE OVERHEAD SIGN PLANS FOR SIGN PEDESTAL ELEVATIONS FOR NEW CONSTRUCTION.
4. ADJUST HEIGHT OF CONCRETE BARRIER WALL ON LOW SIDE OF OFFSET SUPERELEVATED ROADWAYS TO PROVIDE LEVEL GRADE ACROSS TOP OF CONCRETE BARRIER CAP.
5. FOR OVERHEAD SIGNS, SEE STANDARD PLAN S-614-60.
6. TYPE 9 IS A MASH TEST LEVEL 3 (TL-3) APPROVED CONCRETE BARRIER DESIGNED FOR REDIRECTION AND PROTECTION FROM MOST STANDARD ROADSIDE OBSTACLES. TO PROTECT PIERS AND OTHER STRUCTURAL BRIDGE SUPPORTS, A MASH TL-5 DESIGN MAY BE REQUIRED.
1. THE CONTRACTOR'S OPTIONS FOR FILL BETWEEN CONCRETE BARRIER WALLS:
A. PLACE 4 INCHES OF POLYSTYRENE AT BASE BETWEEN CONCRETE BARRIER WALLS.
B. PLACE 1 FOOT OF GRANULAR MATERIAL AT BASE BETWEEN WALLS.
C. PLACE GRANULAR MATERIAL FROM BASE TO BOTTOM OF A 4 INCH CAP.
D. MONOLITHIC CONCRETE WITH FOAM BLOCKOUTS IS NOT PERMITTED.

2. REINFORCING STEEL SHALL EXTEND CONTINUOUS THROUGH CONSTRUCTION JOINTS.

3. SEE OVERHEAD SIGN PLANS FOR SIGN PEDESTAL ELEVATIONS FOR NEW CONSTRUCTION.

4. ADJUST HEIGHT OF CONCRETE BARRIER WALL ON LOW SIDE OF OFFSET OR SUPERELEVATED ROADWAYS TO PROVIDE LEVEL GRADE ACROSS TOP OF CONCRETE BARRIER CAP.

5. FOR OVERHEAD SIGNS, SEE STANDARD PLAN S-614-60.

6. TYPE 8 IS A MASH TEST LEVEL 3 (TL-3) APPROVED CONCRETE BARRIER DESIGNED FOR REDIRECTION AND PROTECTION FROM MOST STANDARD ROADSIDE OBSTACLES, TO PROTECT PIERS AND OTHER STRUCTURAL BRIDGE SUPPORTS, A MASH TL-5 DESIGN MAY BE REQUIRED.
NOTES

1. PAYMENT WILL BE MADE UNDER ITEM 606, TRANSITION TYPE GR9-GR3, CONSISTING OF CONCRETE (CLASS D DR G), REINFORCING STEEL AND OTHER ITEMS SHOWN.

2. TRANSITIONS MAY BE CONSTRUCTED PERPENDICULAR TO ROADWAY CROSS SLOPE. VERTICAL DIMENSIONS ARE PERPENDICULAR TO THE LONGITUDINAL ROADWAY GRADE.

3. CONCRETE AND REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF SECTIONS 601 & 606 AND 602 RESPECTIVELY UNLESS OTHERWISE NOTED.

DESIGN DATA:

REINFORCING STEEL: FY = 60 KSI
CONCRETE: FC = 4.5 KSI

GUARDRAIL TYPE 9

DESIGN DATA:

G-DETECTION: 5/8" OD 7/8" HOLE (TYP.)
CONCRETE CLASS D IS MACRO FIBER REINFORCED. FOR PROJECTS IN THE METRO AREAS (DENVER, LITTLETON, FT COLLINS, DENVER SPRINGS, PUEBLO, SILVERTHORNE, GLENWOOD SPRINGS, GRAND JUNCTION, MONROSE, DURANGO, ALAMOSA), CLASS G CONCRETE SHALL BE USED IN LIEU OF CLASS D.

DESIGN DATA:

CONCRETE CLASS D DR 3H INSIDE DIAMETER FULL DEPTH INSERTS PLACED BEFORE CONCRETE PLACEMENT.

GUARDRAIL TYPE 9

3¾" CIR.
VARIES FROM 1 1/4" TO 8 1/2"

SINGLE SLOPE BARRIER

SECTION A-A

SECTION B-B

SECTION C-C

INFORMATION ONLY

DESCRIPTION
UNIT EACH
STRUCTURAL STEEL (GALVANIZED) LB 22
CONCRETE CLASS D OR G CY 2.4
REINFORCING STEEL (EPoxy COATED) LB 290

Computer File Information

Creation Date: 07/31/19
Designer Initials: JBK
Last Modification Date: 03/05/20
Detailer Initials: LTA
CAD Ver.: MicroStation V8.0 Scale: Not to Scale Units: English

Colorado Department of Transportation
2829 West Howard Place
Denver, CO 80204
Phone: 303-757-9021 FAX: 303-757-9868

Project Development Branch
JBK

STANDARD PLAN NO.
M-606-15

GuARDRAIL TYPE 9

SINGLE SLOPE BARRIER

Issued by the Project Development Branch: July 31, 2019
Project Sheet Number: No. 8 of 11
NOTES
1. WHERE BEVELED METAL BOX SPACERS ARE INSTALLED, PLACE A 1/4" INCH X 3 1/4" INCH AND A 1/4" INCH X 2" INCH PIPE SPACER ON 1 INCH HS BELTS PASSING THROUGH THE INTERIOR OF BOX.
2. ALL METAL BOXES SHALL BE GALVANIZED.

LEGEND

A NESTED THREE BEAM ELEMENTS
ONE 12 GAUGE ELEMENT NESTED OVER ONE 10 GAUGE ELEMENT.
ONE 10 GAUGE THREE BEAM ELEMENT.
ONE 12 GAUGE THREE BEAM ELEMENT.
30 GAUGE = 0.150" THICK
12 GAUGE = 0.108" THICK

1/4" PLATE THICKNESS
1/4" DIA. HOLES

DETAIL A
BEVELED METAL BOX SPACE
SEE NOTE 1

DETAIL B
PLATE A

ELEVATION

PLAN

DOUBLE THRIE BEAM BARRIER CONNECTION TO CONCRETE BARRIER

1/4" PLATE THICKNESS
1/4" DIA. HOLES

SECTION A-A

1. WHERE BEVELED METAL BOX SPACERS ARE INSTALLED, PLACE A 1/4" INCH X 3 1/4" INCH AND A 1/4" INCH X 2" INCH PIPE SPACER ON 1 INCH HS BELTS PASSING THROUGH THE INTERIOR OF BOX.
2. ALL METAL BOXES SHALL BE GALVANIZED.
The cap with 4" concrete or 4" bituminous slope and ditch paving on backed fill, Class 2. The contractor, at his expense, has the option of using concrete or other material acceptable to the Engineer in lieu of backfill, Class 2.

The width of column or pier treatment between columns or obstructions.

The obstruction wider than 3 ft:
- ½" preformed joint material
- Pier column, column support footing, concrete wall, or similar obstructions.

Obstruction 3 ft wide or less:

1. The median in these applications shall be paved on a slope continued from the adjacent paved shoulders by a 10:1 or flatter slope.
2. The pay length for barrier on both sides of an obstruction will be determined by one linear measurement along the guardrail centerline. The backfill and cap between columns or obstructions will not be measured and paid separately but shall be included in the work.
3. Guardrail between columns or obstructions may be styles CA or CD as shown on the plans.
4. Type 9 is a MASH Test Level 3 (TL-3) approved concrete barrier designed for redirection and protection from most standard roadside obstacles. To protect piers and other structural bridge supports, a MASH TL-5 design may be required.

Table of Flare Rates for Permanent Concrete Barrier

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Shy Line Offset (ft.)</th>
<th>Flare Rate for Barrier Inside Shy Line</th>
<th>Flare Rate for Barrier Outside Shy Line</th>
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* The Shy Line Offset is measured from the edge of the traveled way.

NOTES

1. The median in these applications shall be paved on a slope continued from the adjacent paved shoulders by a 10:1 or flatter slope.
2. The pay length for barrier on both sides of an obstruction will be determined by one linear measurement along the guardrail centerline. The backfill and cap between columns or obstructions will not be measured and paid separately but shall be included in the work.
3. Guardrail between columns or obstructions may be styles CA or CD as shown on the plans.
4. Type 9 is a MASH Test Level 3 (TL-3) approved concrete barrier designed for redirection and protection from most standard roadside obstacles. To protect piers and other structural bridge supports, a MASH TL-5 design may be required.

Hazard in Narrow Medians:
- Edge of traveled way (typ.)
- Median barrier end treatment
- Continuous median barrier
- Guardrail centerline for pay length measurement
- Obstruction wider than 3 ft.

Table of Flare Rates for Permanent Concrete Barrier

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* The Shy Line Offset is measured from the edge of the traveled way.
1. At each location where an electric transmission, distribution or secondary line crosses a barrier fence, the contractor shall furnish and install a ground conforming to Article 250 of the National Electrical Code. The ground rod shall be a minimum diameter of 3/4 in. and 8 ft. in length, and driven at least 9 ft. into the ground. The rod shall be connected to each wire with a minimum AWG No. 8 stranded copper wire. Grounding will not be paid for separately but shall be included in the work.

2. End posts, corner posts, and line brace posts shall be assembled by the unit and paid for as such. All work and material associated with each assembly shall be included in the unit price for that assembly.

3. Line brace posts shall be spaced at 4 ft. intervals, where fencing is continuous and where end, corner & line brace posts are not specified.

4. All line posts shall be 5 in. min. diameter and 12 ft. long. All end, corner and line brace posts shall be 6 in. min. diameter and 12 ft. long. All posts and braces shall be treated in accordance with Subsection 710.07.

5. Fence wire may be placed on either the road side or the field side of posts, depending on local conditions. On curves, the wire should be placed on the side which would result in the least amount of tension on the staples. This also applies where wind or other conditions would exert unusual pressure against the wire.

6. Where concrete structures are used as a deer pass, the fence shall end at eyebolts in wings of the structure. Eyebolts in fresh concrete shall be made of 1/2 in. round bars. A minimum of 3 in. inside eye diameter and shall be furnished and installed by the contractor. Cost of eyebolts shall be included in the contract price for fencing.


8. All fence wire ties, brace wires, staples and other wire appurtenances shall be galvanized in conformance with ASTM A 232.

9. The contractor shall re-establish disturbed or destroyed survey monuments to the appropriate accuracy in accordance with Subsection 625.08 of the standard specifications.

10. Continuous line wire shall be high tensile (0.75 k mil). Continuous stay wire shall be mid-tensile (0.50 k mil). Fixed knot to gauge wire (0.06 k mil) shall connect line wire with the vertical stay wire.

11. Deer gate and top braces shall be painted with green paint according to Subsection 708.03 and color no. 14109 of Federal Standard 595B.
PLAN VIEW - TYPICAL DEER GATE INSTALLATION

SECTION A-A

TYPICAL TINE DETAIL

NOTES

1. SIX IN. DOUBLE-ACTING SPRING DOOR HINGE WITH FLAT BUTTON TIPS CUT IN TWO SHALL BE USED AS A SINGLE SWING HINGE AND BE PROVIDED WITH A GREASING NIPPLE AND WELDED TO SUPPORT PLATE.

2. TINES SHALL BE MOLDED IN ONE PIECE OF STEEL (AASHTO M 169, GRADE 1050), WITH NO WELDS ALLOWED.
DEER FENCE, GATES, AND GAME RAMPS

1. Locations of deer fence in the clear zone shall be shown in the plans.
2. Posts within the clear zone shall be drilled.
3. Drill holes perpendicular to the roadway.
4. Knee brace shall be omitted from any end post or corner post within the clear zone.

FENCE DEER OVER CONCRETE BOX CULVERT
Five foot posts and wire fabric shall be installed where the fence passes over a CBC at locations shown in the plans. This work will be paid for as fence deer (special).

FENCE DEER OVER CONCRETE BOX CULVERT
Five foot posts and wire fabric shall be installed where the fence passes over a CBC at locations shown in the plans. This work will be paid for as fence deer (special).

END POST AND CORNER POST
MODIFIED FOR PLACEMENT WITHIN ROADWAY CLEAR ZONE

GAP CLOSURE
Use this detail to close all gaps between 6 inches and 3 feet. GAP CLOSURES SHALL BE INCLUDED IN THE PRICE OF THE FENCE AND NOT BE PAID FOR SEPARATELY.
1. The landing zone shall be flat, stable, and earthen. The area shall be void of objects that may hinder or endanger wildlife. The engineer may adjust the game ramp location as needed.

2. There shall be no disturbance beyond the row or temporary/permanent easements.

3. Fill material shall be structure backfill (Class 2) and meet the requirements of Section 206 with a minimum compaction of 90%.

4. Four inches of topsoil shall be placed in accordance with Section 207.

5. Finished height of backfill/topsoil shall be 2" above lumber.

6. Seeding shall be completed after the engineer approves grading.

7. See the stormwater management plan for the seeding plan.

8. Game ramp is paid per revision of Section 607, fences.

NOTES

- 2 x 8 nominal treated lumber per Sec. 508.03, fasten with 3/8 x 6" lag bolts & washers at each post
- 10 - 12 posts with 1" dia. (Typ.)
- Required 6" gap, use void form to fill
- Geotextile Class 2 placed at 1 foot lifts wrap faced installation with 3 foot lap at front face (see sheet 5 for approved equal).

ALL GAME RAMP POSTS SHALL BE A MINIMUM 4'-0" BELOW GROUND, AND A MINIMUM 12" IN DIAMETER, AND ENCASED IN CONCRETE.

DEER FENCE WIRE FABRIC (Typ.)

DEER FENCE WIRE FABRIC (Typ.)

TOPSOIL, SOIL CONDITIONING, AND SEEDING (NATIVE) FOR ALL DISTURBED AREAS

TOPSOIL, SOIL CONDITIONING, AND SEEDING (NATIVE) FOR ALL DISTURBED AREAS

ROADWAY --- CLEAR ZONE

LEVEL TOP

SECTION A-A

TYPICAL SECTIONS

FRONT ELEVATION VIEW

DEER FENCE WIRE FABRIC (Typ.)

2" X 8" TREATED LUMBER OR EQUIVALENT AS APPROVED BY THE ENGINEER

REAR ELEVATION VIEW

TOPSOIL, SOIL CONDITIONING, AND SEEDING (NATIVE) FOR ALL DISTURBED AREAS

TOPSOIL, SOIL CONDITIONING, AND SEEDING (NATIVE) FOR ALL DISTURBED AREAS

FILL GAME RAMP

LANDING ZONE

CUT GAME RAMP

DEER FENCE, GATES, AND GAME RAMPS

STANDARD PLAN NO.
M-607-4

Standard Sheet No. 4 of 7

Issued by the Project Development Branch: July 31, 2019

Project Sheet Number:

Project Development Branch
JBK
Existing terrain varies.

Round to form a smooth transition.

Undisturbed existing ground or compacted roadway embankment.

Notes:
1. Geotextile reinforcement shall be woven fabric with a minimum average roll value of 4800 lb/ft for installations with a gap and 2400 lb/ft for installations without a gap based on ASTM D4595.
2. Geotextile reinforcement shall be placed by alternating machine direction (MD) with cross machine direction (XD) from layer to layer.
3. The geotextile reinforcement wrap at back face of game ramp shall be pulled back slack free with its end anchored to soil underneath with staples or pins.
4. Minimum splice of all geotextile shall consist of 1 foot of overlap.
5. Geotextile reinforcement wrap at back face of game ramp wall shall be temporarily hung with a spacer board and tack strip. After reaching a total of 2'-0" compacted lift, the tack strip shall be removed and geotextile reinforcement shall be pulled back slack free with its end anchored to soil underneath with staples or pins before the spacer board is pulled.
6. Do not use spacer for the top lift (final lift). Top lift shall abut the game ramp wall.
ALTERNATIVE DEER FENCE

DESIGN NOTES:
1. INSTALL A 4 FT. GATE ADJACENT TO ANIMAL CROSSING STRUCTURES.
2. A 3 INCH MIN. OVERLAP IS REQUIRED PLUS TIES OR CLAMPS TOGETHER EVERY 36 INCHES USING HDG RINGS OR OTHER TYPES OF TIES OR CLAMPS.
3. PLACE A BOTTOM TENSION WIRE AND FENCE FABRIC AT EXISTING GROUND AT POSTS AND WITHIN 2 INCHES OF EXISTING GROUND BETWEEN POSTS.
4. TIE OR CLAMP BOTTOM AND TOP TENSION WIRE TO FENCE FABRICS EVERY 24 INCHES USING HDG RINGS OR OTHER TYPES OF TIES OR CLAMPS.
5. A SINGLE FENCE FABRIC MAY BE USED IF IT MEETS OVERALL MINIMUM DIMENSIONS.

ALTERNATIVE DEER FENCE INSTALLATION WITH ONLY METAL POSTS

NOTES
1. SET GATE POST, BRACE POST, END POST, CORNER POST, AND POST BRACE IN CLASS "B" CONCRETE. SEE SHEET 7 FOR CORNER BRACE.
2. LINE POSTS
A. "T", "W", OR "U" STEEL CHANNEL SECTIONS, MINIMUM WEIGHT 1.33 LB/FT OF LENGTH OR STEEL PIPE, 1.900 INCH OUTSIDE DIAMETER SCHEDULE 40 PIPE, WEIGHT 2.72 LB/FT OF LENGTH OR HIGH TENSILE TRIPLE COATED STEEL PIPE, WEIGHT 2.23 LB/FT OF LENGTH.
B. LINE POSTS ARE 10 FEET IN LENGTH.
3. BRACE POSTS, CORNER POSTS, AND END POSTS
A. STEEL PIPE 2.375 INCH OUTSIDE DIAMETER, WEIGHT 3.65 LB/FT OR HIGH TENSILE TRIPLE COATED STEEL, 2.375 INCH OUTSIDE DIAMETER WEIGHT 3.11 LB/FT.
4. GATE POSTS
A. GATE WIDTHS 6 FEET AND LESS USE STEEL PIPE WITH OUTSIDE DIAMETER 2.375 INCH AND WEIGHT 3.65 LB/FT OR HIGH TENSILE TRIPLE COATED STEEL, 2.375 INCH OUTSIDE DIAMETER WEIGHT 3.11 LB/FT.
5. POST BRACES TO MATCH POST TYPE AND SIZE.
6. USE CORNER BRAZE ON FENCE LINE DEVIATIONS GREATER THAN A 15 DEGREE ANGLE. SEE SHEET 7 FOR CORNER BRAZE DETAILS.
7. TERMINATE FENCE FABRIC AND BARBED WIRE AT EACH CORNER POST.
8. USE 10 FEET SPACING IN AREAS OF FARM ANIMAL USE AS SHOWN.
9. GATE POSTS USE STEEL PIPE 1.875 INCH OUTSIDE DIAMETER WITH WEIGHT OF 2.72 LB/FT.
10. WHERE DOUBLE GATES ARE INSTALLED PROVIDE AT LEAST A 4 INCH GAP BETWEEN GATE FRAMES TO ALLOW FOR LATCH.
11. THE GALVANIZED POSTS SHALL BE STAINED FOREST SERVICE BROWN WHEN REQUIRED PER THE AEROSPACE MATERIAL SPECIFICATION STANDARD AMS 595A 20059.

Computer File Information
Creation Date: 07/31/19
Designer Initials: J BK
Last Modification Date: 07/13/20
Detailer Initials: L TA

Colorado Department of Transportation
2829 West Howard Place
CDOT HQ, 3rd Floor
Denver, CO 80204
Phone: 303-757-9021 FAX: 303-757-9868
Project Development Branch JBK
DEER FENCE, GATES, AND GAME RAMPS

STANDARD PLAN NO. M-607-4
Standard Sheet No. 6 of 7
Issued by the Project Development Branch: July 31, 2019
PLACE 100 LB MINIMUM ROCK OR CONCRETE AFTER THE FENCE FABRIC IS STRETCHED.

TYPICAL SAG SECTION

TYPICAL VERTICAL ALIGNMENT CHANGE

INSTALLATION WITH METAL POSTS (TYP.)

NOTE: OVERLAP THE 50 INCH WIRE AND 4 INCH TIE OR CLAMP TOGETHER. THE SPACING NOT TO EXCEED 2 FT. OF CONNECTIONS.

CATTLE PASS FENCE DETAIL

DEER BARRIER ON CURVES

SEE NOTE 6 ON SHEET 6

PRIVATE PROPERTY

ALTERNATIVE DEER FENCE INSTALLATION WITH ONLY METAL POSTS

FENCE PLACED 1 FT. INSIDE RIGHT OF WAY LINE. FENCE MAINTAINED BY THE STATE AND COUNTY.

TERMINAL BRACE

DEER COUNTRY

USE CORNER POSTS WITH DEVIATIONS GREATER THAN 15 DEGREES.

CORNER BRACE

SEE NOTE 6 ON SHEET 6

HIGHWAY RIGHT OF WAY LINE

HIGHWAY RIGHT OF WAY LINE

HIGHWAY RIGHT OF WAY LINE

HIGHWAY RIGHT OF WAY LINE

HIGHWAY RIGHT OF WAY LINE

HIGHWAY RIGHT OF WAY LINE